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AVIATION AND AERONAUTICAL ENGINEERING



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VOLUME IV

Number 8

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THEORY OF THE AIRSCREW
THE EVOLUTION OF THE AIRPLANE
SOME PROBLEMS OF AIRPLANE DESIGN
THE INTERNAL COMBUSTION TURBINE
THE AIRCRAFT SITUATION

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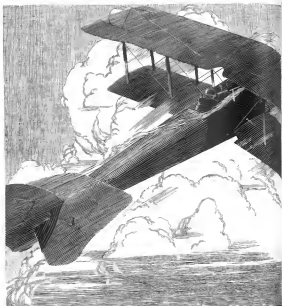
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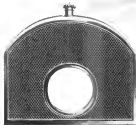
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MAY 15, 1918

AVIATION AND AERONAUTICAL ENGINEERING

VOL. IV. NO. 5

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U. S. DEPARTMENT OF WAR
OFFICE OF THE CHIEF OF ARTILLERY
WASHINGTON, D. C.

Vol. 17

May 15, 1918

No. 6

Theory of the Aircrew

By Professor Georges de Botheant

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AVIATION AND AERONAUTICAL ENGINEERING takes the opportunity of presenting to its readers a personal notice of the work obtained by Professor Georges de Botheant, head of the Polytechnic Institute of Petersburg, in his investigations of the mechanics of the aircrew.

These studies, which are set forth in the form of a new theory of the aircrew, constitute a work of great importance and promise to have a useful influence upon the work of aeronautical engineering both in the matter of primary conception and technique.

Professor Georges de Botheant, who is a Russian by birth, enjoys an international reputation among investigators of aerodynamics as the author of the first mathematical treatment of airplane stability, which he published in 1911, in Paris, under the title of "Etude de la stabilité de l'aéroplane," and which has since served as the fundamental treatise of this science.

Having graduated from the University of Paris with the degree of Doctor of Sciences, R. de Botheant was appointed by the Russian Ministry of Agriculture to fill the chair of applied mechanics and aerodynamics of the Polytechnic Institute of Petersburg. In this capacity he has made a number of valuable contributions in the science of hydrodynamics, aerodynamics, and naval architecture.

In the theoretical domain R. de Botheant claims the authorship of several important works dealing with hydrodynamic resistance, the theory of the aircrew, and the determination of the aerodynamic contribution of the aircrew, in the practical field he created an original system of aircrew construction and discovered the principle of the "aerostatic control" which he claims is of the greatest importance in securing the correct aim of aircraft bombs.

If de Botheant is also the creator of two new types of airplanes, one of which he built in Russia during the war and flew with his own type of aircrew. The machine has been tested in flight and has given results which are in accord with the predictions of its builder.

The Polytechnic Institute having rendered impossible for Professor de Botheant to devote his time to his researches, he decided to place

The results of these investigations

in Russia, that he succeeded in doing at the point of his life by teaching from Petersburg to Moscow in a little car, even as much of his energy in the "Lecture Notes of the American Embassy officials and the officers of the American Military Mission in Russia" as he turned it. R. de Botheant has been fortunate enough to meet from the Russian opinion of his most important scientific papers, one may estimate the hope that Russia's loss will eventually prove America's gain.

The present theory gives a complete picture and an exact quantitative analysis of the whole phenomenon of the working of the aircrew. This theory not only includes all the most important scientific papers, one may estimate the hope that Russia's loss will eventually prove America's gain.

For studying the phenomenon of the working of the aircrew, I adopt as fundamental parameter a quantity which I call relative pitch. The relative pitch is the pitch of the trajectory of the aircrew, measured by taking the pitch of the blade element as unity. I call the relation of the work of the thrust to the work of the torque supplied to the aircrew the specific function. The aircrew of the specific function, as shown in the accompanying diagram, we follow the complete cycle of the whole series of work possible for a aircrew.

The negative values great as absolute value of the relative pitch, the specific function is directed towards the origin of the co-ordinate by branch. There we find our aircrew working as a lever, characterized by the fact that the aircrew of water crossing the axis, except by the blades of the aircrew has the same direction, as the speed of the fluid element directed towards the aircrew. The aircrew of this branch of the specific function which is directed towards the origin, as indicated by data on the diagram, corresponds to a aircrew working as a lever, is a purely aircrew manner, for the first time in the present theory and named by me the aircrew ring working state.

The phenomenon takes place in the following order: We imagine the aircrew working in the state of aircrew as shown above.

The aircrew working in the state of aircrew as shown above, is a purely aircrew manner, for the first time in the present theory and named by me the aircrew ring working state.

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PROFESSOR GEORGES DE BOTHEANT

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THE HANDELY PAGE 1900

The Handley Page Twin of 1916

Clearly following it came the huge Handley Page biplane of 1916, with (at first) two Rolls-Royce engines of 250 hp. each. Later everything else in the war, they have gone up, and the power is now far higher. One of these machines in 1916 took a pilot and 20 passengers to a height of 7000 ft., and in 1917 another (now from London to Geneva and then back to Constantinople).

The 1916 Navigator

The most noteworthy of the small machines of 1916 was the Navigator biplane, with the 50-hp., and later the 110-hp., Le



THE 1916 NAVIGATOR, 1916

Reber engine. This was an excellent fighting machine, and a direct ancestor of the "Tallied" B. It was remarkable for the curious V formed by the struts between the wings.



THE 1916 NAVIGATOR, 1916

Virtually there is only a single step to the lower wings, so that it is more of a D-place than a biplane. The German



THE 1916 NAVIGATOR, 1916

applied this single-step idea in their Albatross single-seat "charms" of 1915.



THE 1916 NAVIGATOR, 1916



THE GOTH, 1917

The Mark of 1917

The year 1917 is still too close for me to give every particular about the outstanding features of its machines, but we may mention those which are known to be familiar to the student, and of course may illustrate their outline to show the progress with the older types, and then be enabled to see the bag of development.

Here we have the Sopwith "Camel", the Spad, designed by M. Borel, of Desperdours fame, and the Albatros, D.1 type—all extremely developed of the Navigator and the Type



THE DE HAVILLAND 4, 1917

four, and the Tallied. Also we have the de Havilland 4, built by the Aircraft Manufacturing Company, (Ltd), and designed by Captain de Havilland, as he now is, and we have the S.E.B. built and designed by its successors at the Royal



THE S.E.B., 1917

Aircraft factory, both descendants of the S.E. Then there is the "British Fighter" built by the British and Colonial Aircraft Company, of Bristol, and designed by Captain Denham, a grandson of King in Scotland, who built a machine of his own in 1909. It shows traces of the 1910 tractor biplane



THE BRITISH FIGHTER, 1917

Finally we have the Gotha G.IV, of evil renown, a descendant of the Condor and Handley Page two-engined machines. It has produced the vast three-engined 1900-hp. Caproni triplane, but its sheer size prevents a type being illustrated to scale. And so we have to secure gradually, at the earliest steps in the development of the airplane from its earliest ancestral effort to its most modern types.

Some Problems of Airplane Design

By B. Russell Shaw

In the line of Aviation when we are seeking and building thousands of airplanes, there are many who are the field men, small airplane designers and aeronautical engineers. The experience of these men has been mostly practical, it may be said, and they are constantly serving at some conditions or design which the past experience has proven inadequate or impossible of making up under hard usage and actual flight conditions. They require genuine aeronautical experts. Men who have made it a special study from the beginning of its attack. They can be college graduates or students at universities but must have sufficient knowledge to make all these diagrams and perform them clearly. Above all, those who have gone through the building up of the industry are particularly fitted

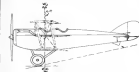


FIG. 1

to set or practical builders and designers. It requires airplane men to construct the complete line of airplanes, not men from different trades in the aeronautical industry.

Generally all air-mechanics have the factor of safety, and what other all in this thing? The student of the famous St. Lawrence River bridge which had its very last engineering in the world, flying its strength, and its collapse, is a proof of this old saying. "The aviator's factor of safety is only a factor of ignorance." These methods are nevertheless to be used now, and to prevent its being a factor of ignorance, we must use fundamental factors of experience.

A line of the most common mistakes at these positions, the basic ones, to the writer's notice are the following: A general error in designing an airplane is the correct balancing of the component parts and giving them the correct relation with the center of pressure.

Some designs in the case of the complete machine, locate the center of pressure and center of gravity, then give them the correct relation by shifting such weights as the pilot and passenger to the proper task. This method is very poor, and it does not allow the body, which is free to be attached at the proper place. The proper task should be given as nearly perfect position as possible, and not shifted.

The main should not be moved, for once a proper and comfortable arrangement is reached that arrangement should remain as near moving from this point may cause changing in its structural position. The main should be fixed and completely fixed on consideration the range of vision of the pilot. It is to be placed as far as possible from the machine. It is to be placed in the rear and must have ample room for action. It is sometimes an advantage in later years, and shows the other so that the top may be folded up allowing him to sit down on the floor of the fuselage. For observation, reason work is best dropped, through a drop in the floor.

The entire of geometry of the entire body assembly is fixed by a very simple method shown in Fig. 1. The weights of the component parts are multiplied by their respective distances

$4A + 4B + 4C + 4D + 4E + 4F + 4G + 4H + 4I + 4J + 4K + 4L + 4M + 4N + 4O + 4P + 4Q + 4R + 4S + 4T + 4U + 4V + 4W + 4X + 4Y + 4Z$

After this is done the wings should be considered. They should be drawn upon separate sheet and the resulting C, P, and G, determined, allowance being made for the extra efficiency of the upper plane affecting the combined location of the C, P.

The wings are then placed on the body and shifted until the desired relation of C, P, and G, is obtained. This will apply to a neutral tail setting. If a positive or negative tail is used, the fuselage is shifted by it until the desired relation is obtained. The resulting forces obtained by the bearings between the C, P, or G, and the C, P, or G, is as well as those between the line of thrust and pressure, and the pilot can very carefully adjust setting the tail plane so that the proper degree of longitudinal stability may be obtained.

There are several things to consider when placing the structure, of which a few are often overlooked. This must, above all, be strong and well made. In the case where the stick is used with a control at the lower end it should be made enough to give plenty of leverage on the bearings, these should be braced linked and large enough to take the constant wear.

The rudder bar should be long as the case of action may be obtained, and also to allow plenty of leverage for a hand pull as in recovering from a spin. It is well to place small springs on the first bar, to prevent the rudder from slipping. There should be ample control with a foot control plate to cover the edge of the bar and to take the most control of the rudder control in the case where the rudder is used in a rudder bar and makes a very clumsy-looking job. Allow plenty of bearing area on the bar, as the rudder is used in a rudder bar and makes a very clumsy-looking job. Allow plenty of bearing area on the bar, as the rudder is used in a rudder bar and makes a very clumsy-looking job.

Always place the controls in a comfortable position in the pilot in a long flight will not be cramped. The instrument

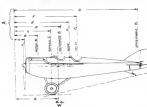


FIG. 2

board should not be placed so low that the pilot will strike it with his hands or knees.

In a number of European machines a small instrument, with reason here is provided on the stick, that the pilot may look both hands free to make notes or "pull the gun." This is never done on American machines, for the pilot may look the instrument and become confused and may make it so needed. It is used only where real work is to be done.

The spark and throttle controls must be in such position that they can be easily and quickly reached by a most natural

or other fuel into the combustion chamber the number of planes.

Cooling

The air admitted to the machine also has the effect of moderating the temperature of a reasonably low heat, and no water cooling was necessary, as an extensive heating of the blades was found to occur. The blades were constructed of unalloyed, and as water was not formed during the process of combustion, no corrosion occurred throughout the hour passed through which the turbine was tested, and the blades gave no trouble. It was difficult to obtain the anticipated power out of the machine, and the disappointment was due in satisfactory as had been anticipated, but some facts were successfully employed, and it is interesting to note that heat was obtained with a vacuum, a phenomenon at the Diesel type being adopted.

The experiments demonstrated that a high specific power could not be obtained from the combustion chambers when the number was relatively small, and that the efficiency of these chambers is lower when they are small than when of moderate size. This tends to indicate the difficulty of engineering a relatively low-powered gas turbine and the suitability of this type of engine for the largest output. It is, of course, apparent that there are no excessive limits of power with a turbine, as in a reciprocating engine, where the economy on the power cannot be allowed to reach a high figure. It was found that the design of the motor for gas could not be based on that of the ordinary steam turbine motor, and that the air-mixing process between two engines was necessary for reasonable efficiency with this cycle.

The simplest aspect of the design of the stationary turbine is of great importance, and the of considerable value has been obtained from the results of the experiments on the machine. The temperature of the mixture before ignition has an in-

portant influence upon the efficiency of a gas turbine, and this should be approximately the same as that of the turbine gas, also many other important points on operation with the design of internal-combustion engines were derived from the results of these experiments. No attempt was made to obtain an extremely light weight per horsepower, such as is necessary for aircraft work, so as to the present the experiments have realized their attention to machines for industrial work.

An internal-combustion turbine proposed by Long which makes use of the steam both for purposes of overrunning and keeping the temperature of the internal parts within reasonable limits has been built, and is intended mainly to employ heavy oils. This is of the horizontal design with an output of 30 hp, and the ordinary section heating with several rows of blades is employed. The machine is of the double-flow type, and the admission takes place in the center through one port, there being three valves, one each for air, oil, and water admission. The valves are of the piston type, and are operated by a governor actuated on a low shaft driven from the main shaft through gearing.

The air compressor has to supply air at a high pressure in order to give a suitable high temperature to cover the heating of the heat fluid which is injected into the turbine immediately after the air. Despite the combustion was intense, water is sprayed in, and, owing to the heat generated by the combustion of the fuel, it is converted into steam. The sprayed gas and steam then passes through nozzles on to the vanes of the turbine, at which time rapid drop in atmospheric pressure and their energy becomes converted into work. There is no doubt that the problem of designing a commercially successful internal-combustion turbine will remain to be solved, and there appears to be no reason to anticipate that this type of engine must be applied necessarily to aircraft.



THREE-QUARTER FRONT VIEW OF THE SCURRY-BENTLEY

An American Pioneer Design

The construction is a new mode that the manifold difficulties which have been due to the lack of original thought in American airplane design. While this opinion was perhaps justified in some cases, it should nevertheless be considered that before the country entered the great war, there was no incentive, because of small Army and Navy appropriations and lack of aviation interest, to develop original types of machines.

That some American airplane designers were not, however, inhibited by such ideas in foreign developments can be seen from the accompanying illustrations which represent a single water-cooled engine and built in 1916 by Clarence C. Leaning, the chief engineer of the Stratton Aircraft Co. of Boston, Mass., for the United States.

This machine was the outgrowth of a design originally developed in 1914 by Mr. Leaning and Lewis (now Col.) T. deW. Hildebrand, U. S. A., at the Army Flying school at Fort Dodge, Cal. As may be seen, the machine embodied a number of features which are now commonly found on the latest machines of the

fighting type, but which were distinctly ahead of their time. One may then note the ground crew, the "half wing" feature created by the streamlining of the single lower span, the careful seating of the stationary engine and the use of overhead sections on the wings, both of which became recognized German features but a year later.

Particular attention was also paid to the design toward affording a wide range of view and facilities for the mounting of a machine gun, while the construction of the ground loop was quite suitable. It should be noted that all structural parts of this machine were built of vanadium steel.

This machine was fitted with a 100 hp. Hispano-Suiza engine of the 8-cylinder, water-cooled type and weighed, net, 2,000 lb. During 1916 it was frequently flown by Lewis Hildebrand and Bert Smith, but the restricted nature of Quantico Field, where the trials took place, were such as to cause several crashes to be made. It was little realized at the time how typical these experiments were of what has been found in Europe in the development of new machines.



SIDE VIEW OF THE SCURRY-BENTLEY



AMERICAN NAVAL FLYING BOAT BEING SET UP BEHIND IN PLACE—THIS MACHINE, WHICH IS EVANGELIST OF FLYING DESIGN, IS INTERESTING IN ACCORDANCE WITH ITS PARTICULAR DESIGN AND ALSO BECAUSE OF THE CONSTRUCTION OF THE SCURRY-BENTLEY

(C) Hotel and Airport

(c) The wires shall be a plain woven (d) The fabric must be subject to stresses and free from manufacturing imperfections.

(e) The fabric under normal moisture conditions must not weigh more than 2.5 ounces per square yard.

(f) The weight must be 30 inches.

Technical Properties and Tests.—(1) The fabric must be tested in accordance with paragraph 1 (a), (b), (c), (d), and (e) and repeated for at least two hours in an atmosphere of 45 per cent relative humidity at 70 deg. F. (25 deg. C.) and then tested in this atmosphere.

(2) The distance between the jaws or clasp of the testing machine at the beginning of the test shall be 4 inches. (3) The reading of the testing machine at the rate of 12 inches per minute during the test.

(4) The average breaking load of the five specimens, out in the direction of the warp and the average breaking load of the five specimens in the direction of the filling, as shown in Fig. 1, must each be at least 15 pounds.

(5) The elongation shall be observed when the specimens are subjected to each of the loads given in Table 1.

(6) Whenever practicable an average record shall be taken.

(7) The elongation must not exceed the values given in Table 1 more than 15 per cent.

(8) The average results for both warp and filling shall be reported separately.

Stress in Pounds.	Elongation in Inches.	Direction of Strain.
15	0.10	Warp
25	.15	Warp
35	.20	Warp
45	.25	Warp
55	.30	Warp
65	.35	Warp
75	.40	Warp
85	.45	Warp
95	.50	Warp
105	.55	Warp
115	.60	Warp
125	.65	Warp
135	.70	Warp
145	.75	Warp
155	.80	Warp
165	.85	Warp
175	.90	Warp
185	.95	Warp
195	1.00	Warp
205	1.05	Warp
215	1.10	Warp
225	1.15	Warp
235	1.20	Warp
245	1.25	Warp
255	1.30	Warp
265	1.35	Warp
275	1.40	Warp
285	1.45	Warp
295	1.50	Warp
305	1.55	Warp
315	1.60	Warp
325	1.65	Warp
335	1.70	Warp
345	1.75	Warp
355	1.80	Warp
365	1.85	Warp
375	1.90	Warp
385	1.95	Warp
395	2.00	Warp
405	2.05	Warp
415	2.10	Warp
425	2.15	Warp
435	2.20	Warp
445	2.25	Warp
455	2.30	Warp
465	2.35	Warp
475	2.40	Warp
485	2.45	Warp
495	2.50	Warp
505	2.55	Warp
515	2.60	Warp
525	2.65	Warp
535	2.70	Warp
545	2.75	Warp
555	2.80	Warp
565	2.85	Warp
575	2.90	Warp
585	2.95	Warp
595	3.00	Warp
605	3.05	Warp
615	3.10	Warp
625	3.15	Warp
635	3.20	Warp
645	3.25	Warp
655	3.30	Warp
665	3.35	Warp
675	3.40	Warp
685	3.45	Warp
695	3.50	Warp
705	3.55	Warp
715	3.60	Warp
725	3.65	Warp
735	3.70	Warp
745	3.75	Warp
755	3.80	Warp
765	3.85	Warp
775	3.90	Warp
785	3.95	Warp
795	4.00	Warp
805	4.05	Warp
815	4.10	Warp
825	4.15	Warp
835	4.20	Warp
845	4.25	Warp
855	4.30	Warp
865	4.35	Warp
875	4.40	Warp
885	4.45	Warp
895	4.50	Warp
905	4.55	Warp
915	4.60	Warp
925	4.65	Warp
935	4.70	Warp
945	4.75	Warp
955	4.80	Warp
965	4.85	Warp
975	4.90	Warp
985	4.95	Warp
995	5.00	Warp
1005	5.05	Warp
1015	5.10	Warp
1025	5.15	Warp
1035	5.20	Warp
1045	5.25	Warp
1055	5.30	Warp
1065	5.35	Warp
1075	5.40	Warp
1085	5.45	Warp
1095	5.50	Warp
1105	5.55	Warp
1115	5.60	Warp
1125	5.65	Warp
1135	5.70	Warp
1145	5.75	Warp
1155	5.80	Warp
1165	5.85	Warp
1175	5.90	Warp
1185	5.95	Warp
1195	6.00	Warp
1205	6.05	Warp
1215	6.10	Warp
1225	6.15	Warp
1235	6.20	Warp
1245	6.25	Warp
1255	6.30	Warp
1265	6.35	Warp
1275	6.40	Warp
1285	6.45	Warp
1295	6.50	Warp
1305	6.55	Warp
1315	6.60	Warp
1325	6.65	Warp
1335	6.70	Warp
1345	6.75	Warp
1355	6.80	Warp
1365	6.85	Warp
1375	6.90	Warp
1385	6.95	Warp
1395	7.00	Warp
1405	7.05	Warp
1415	7.10	Warp
1425	7.15	Warp
1435	7.20	Warp
1445	7.25	Warp
1455	7.30	Warp
1465	7.35	Warp
1475	7.40	Warp
1485	7.45	Warp
1495	7.50	Warp
1505	7.55	Warp
1515	7.60	Warp
1525	7.65	Warp
1535	7.70	Warp
1545	7.75	Warp
1555	7.80	Warp
1565	7.85	Warp
1575	7.90	Warp
1585	7.95	Warp
1595	8.00	Warp
1605	8.05	Warp
1615	8.10	Warp
1625	8.15	Warp
1635	8.20	Warp
1645	8.25	Warp
1655	8.30	Warp
1665	8.35	Warp
1675	8.40	Warp
1685	8.45	Warp
1695	8.50	Warp
1705	8.55	Warp
1715	8.60	Warp
1725	8.65	Warp
1735	8.70	Warp
1745	8.75	Warp
1755	8.80	Warp
1765	8.85	Warp
1775	8.90	Warp
1785	8.95	Warp
1795	9.00	Warp
1805	9.05	Warp
1815	9.10	Warp
1825	9.15	Warp
1835	9.20	Warp
1845	9.25	Warp
1855	9.30	Warp
1865	9.35	Warp
1875	9.40	Warp
1885	9.45	Warp
1895	9.50	Warp
1905	9.55	Warp
1915	9.60	Warp
1925	9.65	Warp
1935	9.70	Warp
1945	9.75	Warp
1955	9.80	Warp
1965	9.85	Warp
1975	9.90	Warp
1985	9.95	Warp
1995	10.00	Warp
2005	10.05	Warp
2015	10.10	Warp
2025	10.15	Warp
2035	10.20	Warp
2045	10.25	Warp
2055	10.30	Warp
2065	10.35	Warp
2075	10.40	Warp
2085	10.45	Warp
2095	10.50	Warp
2105	10.55	Warp
2115	10.60	Warp
2125	10.65	Warp
2135	10.70	Warp
2145	10.75	Warp
2155	10.80	Warp
2165	10.85	Warp
2175	10.90	Warp
2185	10.95	Warp
2195	11.00	Warp
2205	11.05	Warp
2215	11.10	Warp
2225	11.15	Warp
2235	11.20	Warp
2245	11.25	Warp
2255	11.30	Warp
2265	11.35	Warp
2275	11.40	Warp
2285	11.45	Warp
2295	11.50	Warp
2305	11.55	Warp
2315	11.60	Warp
2325	11.65	Warp
2335	11.70	Warp
2345	11.75	Warp
2355	11.80	Warp
2365	11.85	Warp
2375	11.90	Warp
2385	11.95	Warp
2395	12.00	Warp
2405	12.05	Warp
2415	12.10	Warp
2425	12.15	Warp
2435	12.20	Warp
2445	12.25	Warp
2455	12.30	Warp
2465	12.35	Warp
2475	12.40	Warp
2485	12.45	Warp
2495	12.50	Warp
2505	12.55	Warp
2515	12.60	Warp
2525	12.65	Warp
2535	12.70	Warp
2545	12.75	Warp
2555	12.80	Warp
2565	12.85	Warp
2575	12.90	Warp
2585	12.95	Warp
2595	13.00	Warp
2605	13.05	Warp
2615	13.10	Warp
2625	13.15	Warp
2635	13.20	Warp
2645	13.25	Warp
2655	13.30	Warp
2665	13.35	Warp
2675	13.40	Warp
2685	13.45	Warp
2695	13.50	Warp
2705	13.55	Warp
2715	13.60	Warp
2725	13.65	Warp
2735	13.70	Warp
2745	13.75	Warp
2755	13.80	Warp
2765	13.85	Warp
2775	13.90	Warp
2785	13.95	Warp
2795	14.00	Warp
2805	14.05	Warp
2815	14.10	Warp
2825	14.15	Warp
2835	14.20	Warp
2845	14.25	Warp
2855	14.30	Warp
2865	14.35	Warp
2875	14.40	Warp
2885	14.45	Warp
2895	14.50	Warp
2905	14.55	Warp
2915	14.60	Warp
2925	14.65	Warp
2935	14.70	Warp
2945	14.75	Warp
2955	14.80	Warp
2965	14.85	Warp
2975	14.90	Warp
2985	14.95	Warp
2995	15.00	Warp
3005	15.05	Warp
3015	15.10	Warp
3025	15.15	Warp
3035	15.20	Warp
3045	15.25	Warp
3055	15.30	Warp
3065	15.35	Warp
3075	15.40	Warp
3085	15.45	Warp
3095	15.50	Warp
3105	15.55	Warp
3115	15.60	Warp
3125	15.65	Warp
3135	15.70	Warp
3145	15.75	Warp
3155	15.80	Warp
3165	15.85	Warp
3175	15.90	Warp
3185	15.95	Warp
3195	16.00	Warp
3205	16.05	Warp
3215	16.10	Warp
3225	16.15	Warp
3235	16.20	Warp
3245	16.25	Warp
3255	16.30	Warp
3265	16.35	Warp
3275	16.40	Warp
3285	16.45	Warp
3295	16.50	Warp
3305	16.55	Warp
3315	16.60	Warp
3325	16.65	Warp
3335	16.70	Warp
3345	16.75	Warp
3355	16.80	Warp
3365	16.85	Warp
3375	16.90	Warp
3385	16.95	Warp
3395	17.00	Warp
3405	17.05	Warp
3415	17.10	Warp
3425	17.15	Warp
3435	17.20	Warp
3445	17.25	Warp
3455	17.30	Warp
3465	17.35	Warp
3475	17.40	Warp
3485	17.45	Warp
3495	17.50	Warp
3505	17.55	Warp
3515	17.60	Warp
3525	17.65	Warp
3535	17.70	Warp
3545	17.75	Warp
3555	17.80	Warp
3565	17.85	Warp
3575	17.90	Warp
3585	17.95	Warp
3595	18.00	Warp
3605	18.05	Warp
3615	18.10	Warp
3625	18.15	Warp
3635	18.20	Warp
3645	18.25	Warp
3655	18.30	Warp
3665	18.35	Warp
3675	18.40	Warp
3685	18.45	Warp
3695	18.50	Warp
3705	18.55	Warp
3715	18.60	Warp
3725	18.65	Warp
3735	18.70	Warp
3745	18.75	Warp
3755	18.80	Warp
3765	18.85	Warp
3775	18.90	Warp
3785	18.95	Warp
3795	19.00	Warp
3805	19.05	Warp
3815	19.10	Warp
3825	19.15	Warp
3835	19.20	Warp
3845	19.25	Warp
385		

concentrated in hexagonal in the forward portion and tapers to a vertical knife-edge at the rear.

The engine is a 100-hp. General Motors (German copy of the Hispano). The mixture is an "Axiol" and measures 2.60 in. in diameter.

The armament consists of two synchronized Spandau machine guns, which are fired manually or separately, according to German claims, and machine clocks in 4,500 r.p.m. in 17 minutes. The late Captain von Richthofen used a Fokker triplane in his "Fritz" course.

A new German airplane, a new German two-seater fighter has recently made its appearance on the Western front. One of these machines was brought down by the French, and despite extensive "dissection," it was as badly wrecked that the investigation does not afford a detailed description, and only its general outline is therefore known.

It has not even been possible to ascertain beyond doubt the name of its manufacturer, as that is hidden behind the initials H. W., which is variously believed to indicate Heinkel, or Hannoverian Works.

The most striking features of the H. W. biplane are a very flat, streamlined body, reaching close to the upper plane, and a bipedal tail. The latter consists of a distinct section in German airplane design.

The most unusual characteristic of the H. W. is the *Zwisch* wing shape of the upper plane, whereas the lower plane has the well known *Elliptic* form, that is to say, the tips of the upper plane slope outwardly, while those of the lower plane slope inward.

The plane is staggered about 9.00 in. forward and set at a slight dihedral and the wing chord may amount to 10 m.

The span of the upper plane is about 13 m.; that of the lower plane is slightly smaller and is believed to be in the neighborhood of 10 m. Span varies as to the position of a center section, as no trace of a cable has been found in



the wreckage of the H. W. It is, however, quite possible that the upper plane, which in all two cases, was directly attached to the upper longitudinal of the body, for all French biplanes are agreed as to the short distance separating the body from the upper plane.

Only the upper plane carries ailerons; those on the lower plane, which are of the *interplane* type, are connected with one another by a pair of interplane struts, sloping outwardly, according to other side of the body.

The engine is a 100-hp. General Motors (German copy of the Hispano). The mixture is an "Axiol" and measures 2.60 in. in diameter.

The tail consists of two arm-struts—very, according to other reports, impossible—planes which are set in bipedal fashion

one above the other. The upper plane is considerably smaller, as may be seen from the accompanying diagrams, than the lower plane, and appears to act as a stabilizer only, whereas the lower plane carries a balanced elevator. The middle does not appear to be balanced, but is provided by a vertical fin.

The armament consists of a synchronized machine gun, forward, and a second gun mounted on a gun rack. (Owing to the great depth of the body it appears that the gun rack, from the after seat, lies over the plane, that is, forward of the front plane.)

Two biplanes were shot down by the English over the front, while others are fitted with a machine. This does not mean that the H. W. biplane belongs to the German Colon, but is, in the general utility class of airplanes.

Germanies' Latest Aircraft, March 27, 1918

Revels the *Reichswehr* is ready to give to a private in Mr. Japane-Hilke as to details of seven British air machines, Germany, Mr. Mergemann, 1. Administrative of State of War, made on March 24, in the House of Commons, the following declaration:

"Seven October we have made 28 different raids into Germany, and we have dropped 48 tons of explosives—a considerable amount. The most important of these raids were the ones which these raids have been carried out during the winter have been extremely difficult. In the latter night, throughout the winter, it is only on rare occasions that they can be successfully carried out."

"Approximately 200 flights have been made in the course of these raids, during which only 10 machines have been lost. The loss has been due to the fact that the machines have been carried out and the amount of explosives dropped, while the increased distance to which raids have been carried into Germany is most satisfactory. This is particularly so in the case of the machine made during March, which lost its tail in the night."

"I would point out that the majority of raids in British hands have been carried out at night, and the results of these raids have been taken of the heavy bombs, placing in accuracy of the reports received at their other hand at the end of the month. Further, by attacking in daylight, it has been possible to concentrate attacks on objects of great military importance—a striking contrast to the precautions usually adopted by the enemy."

"During the night raids our machines have descended to low heights and fired at searchlights, guns, and anti-aircraft stations. A study of these raids has been observed in the enemy's air stations, the number of machines, guns, and anti-aircraft. These latter have been defeated with less success than we attempted to interfere."

"On other occasions our pilots have attacked enemy machines driven up to the very heights of the sky, and have brought them down to the ground. The following report is a most recent report of the results obtained."

"Three aeroplanes left at 5.30 a.m. in the hands of the night raiders, and landed at the German Works at Bourges. Seven of these machines reached the objective. One machine failed to return, being seen to fire a green light on the night journey, and on the day, and was found, apparently with engine trouble, south of Orléans."

The following bombs were dropped on the objective with excellent results:

100 lbs. (100 lbs.)
100 lbs. (100 lbs.)
100 lbs. (100 lbs.)
100 lbs. (100 lbs.)
100 lbs. (100 lbs.)
100 lbs. (100 lbs.)
100 lbs. (100 lbs.)
100 lbs. (100 lbs.)
100 lbs. (100 lbs.)
100 lbs. (100 lbs.)

"Several bombs were seen on the Dames Motor Works, all several on the railway lines. Moreover, fifteen were set on fire. A train which was coming in the station was also set on fire. Two bombs burst over the electric power line in the town, one bomb the railway station, one on the gasworks, and one on the bridge. The bridge was hit by the bomb, and two bombs a large munition factory southeast of the town. A total of 36 planes were exposed to daylight, which lost sight of them very well, and which show losses in the night."

"Three enemy aeroplanes attacked our machines over Bourges, one being a two-seater and the other two Albatros D.I."

"After the first combat the enemy aircraft followed our machines, shooting at long range, and then withdrew."

The Aircraft Situation

Very little as to the plans of the War Department has been known since the appointment of John D. Ryan as Director of Aircraft and of Gen. William L. Kirtley as chief of the Division of Military Aeronautics, Aviation Section, Signal Corps. With plans and the organization of the Signal Corps, it is believed that no radical changes will be made until supporting legislation is secured. This legislation may also appear in the form of a special bill, but probably the President will issue a law. It is thought that the law which has passed the House and will be reported to the Senate will be amended to make practically the same changes to aircraft without other Congressional intervention.

The organization of the transportation plan is possible. It is known, however, that the Aviation Section will be completely divided into the Signal Corps. Whether it will remain under the direction of the Secretary of War, or passed with the Signal Corps and administered by a new chief officer, is a matter of conjecture, but the impression is that the Air Service will become a separate service in passing along these changes will be well informed.

It is understood that General Kirtley's plan is to have a new organization to be known as the Air Service, which is the new one used by the American War Department. The plan is to have a new organization to be known as the Air Service, which is the new one used by the American War Department. The plan is to have a new organization to be known as the Air Service, which is the new one used by the American War Department.

Mr. Ryan is a new man with his part in the plans of the organization is additional to his regular duties. General Ryan is the Director of the Air Service, and is also the Director of the Transportation and Supply Departments. The Signal Corps will be placed under the command of Colonel Wadsworth, who is now in the Signal Corps. The Signal Corps will be placed under the command of Colonel Wadsworth, who is now in the Signal Corps.

At least one notable change has been made in the personnel of the Air Service. The new man to be made is the appointment of Mr. Harry L. Shreve as its commander in the Army, and its appointment is the President to date from April 21, 1918. The new man to be made is the appointment of Mr. Harry L. Shreve as its commander in the Army, and its appointment is the President to date from April 21, 1918.

The Aircraft Board

John D. Ryan, the Director in Aircraft, is also chairman of the Aircraft Board in place of William L. Kirtley, resigned. This change is correct that all of the members of the board have been in their respective positions, no change of the board is known. It is known, however, that Harry B. Thayer, who has been on the board since March 1, is not under the same order as the board. The board is the board of the Army and the Chief Constructor of the Navy staff is members of the board. Therefore it would appear that Mr. Ryan is the board, and Mr. Thayer is the board.

Anonymous Confirmed

The institution by the President of John D. Ryan of the Division of Military Aeronautics, Aviation Section, Signal Corps, it is believed that no radical changes will be made until supporting legislation is secured.

Incidents

Many cases of the aircraft situation have been reported to the House of Representatives during the past several days. The House of Representatives has been informed of the situation by the President in General Douglas. The House of Representatives has been informed of the situation by the President in General Douglas.

The House of Representatives has been informed of the situation by the President in General Douglas. The House of Representatives has been informed of the situation by the President in General Douglas.

signs the whole matter over to Attorney General Gregory, who was authorized to make a thorough investigation of the "whole case" in regard to the production of aircraft by the House.

The appointment of the President's decision was made known by the House of Representatives. The House of Representatives has been informed of the situation by the President in General Douglas.

The appointment of the President's decision was made known by the House of Representatives. The House of Representatives has been informed of the situation by the President in General Douglas.

The President also made public some letters he had sent to Mr. Bingham or Secretary of War Baker in the last five months in connection with the investigation. The letters show that the President in January asked Mr. Bingham to come to Washington and see the whole matter from the beginning to the end. The President also made public some letters he had sent to Mr. Bingham or Secretary of War Baker in the last five months in connection with the investigation.

The Senate to Investigate

On May 1 Senator Chamberlain, chairman of the Committee on Military Affairs, introduced a resolution asking for an investigation of the aircraft situation by the Senate. The Senate has been informed of the situation by the President in General Douglas.

It is understood that Senator Chamberlain's plan is to make a thorough investigation of the aircraft situation by the Senate. The Senate has been informed of the situation by the President in General Douglas.

Cost of Inquiry Proposed

Another feature was added to the plan when it became known that Major-General Robert C. Gray, Chief of the Signal Corps, had been appointed to the position of Director of the Signal Corps. The Signal Corps has been informed of the situation by the President in General Douglas.

Bingham's Reported Intent

According to press reports disseminated from the official files of the government have been made available for the use of the House of Representatives. The House of Representatives has been informed of the situation by the President in General Douglas.

The House of Representatives has been informed of the situation by the President in General Douglas. The House of Representatives has been informed of the situation by the President in General Douglas.



"A Great Net of Navy Lines Through
an Ocean of Unapproachable Pain"

What Your Red Cross Dollars Do

An accounting of Expenditures of the First Red Cross War Fund

Every one of the twenty million and more Red Cross members mentioned in this statement. Your local Red Cross Chapter can give you further details.

First War Fund Appropriations up to March 1st, 1918

Foreign Relief	United States Relief
Relief in France.....	1. U. S. Army Base Hospitals.....
Relief in Belgium.....	2. U. S. Navy Base Hospitals.....
Relief in Russia.....	3. U. S. Medical and Hospital Work.....
Relief in Roumania.....	4. U. S. Sanitary Service.....
Relief in Italy.....	5. U. S. Camp Service.....
Relief in Serbia.....	6. U. S. Miscellaneous.....
Relief in Great Britain.....	
Relief in other Foreign Countries.....	
Relief for Prisoners, etc.....	
Equipment and expenses in U. S. of D.....	
Personnel for Europe.....	
Total Foreign Relief.....	
Excluded as to use by Donor.....	

At the close of the first year of the War the Red Cross goes to the public for the raising of the Second War Fund with a record of appropriations which warrants continued contribution to the great relief work. As an industrial citizen of your community, join with your local Red Cross Chapter to make this campaign successful. Your Red Cross is the Army behind the Army. Give till your heart says stop.

Second Red Cross War Fund Week May 20-27

This space contributed to the Winning of the War by
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Through the Devotion of Advertising, U. S. Government Committee on Public Information



Gillette Safety Razor



Have You Seen the
New Gillette
Specially Designed for
the Fighting Man?

THESE models were designed by members of the Gillette Organization, who have seen service with the Colors and know what the soldier is up against.

Hundreds of Colors and men are buying them—the U. S. Service Set in metal case, and the new Kwik-shave set for Uncle Sam's soldiers and officers.

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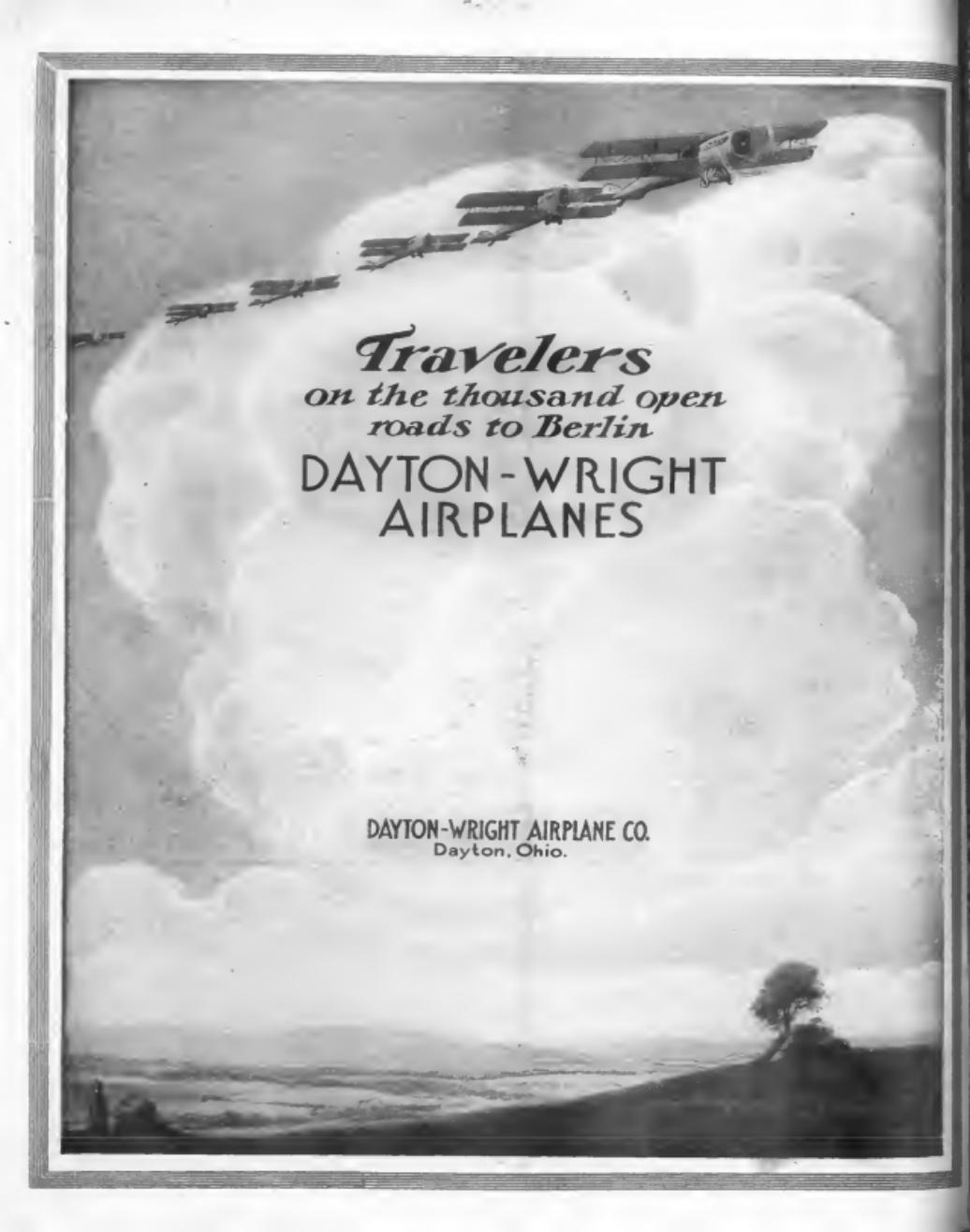
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